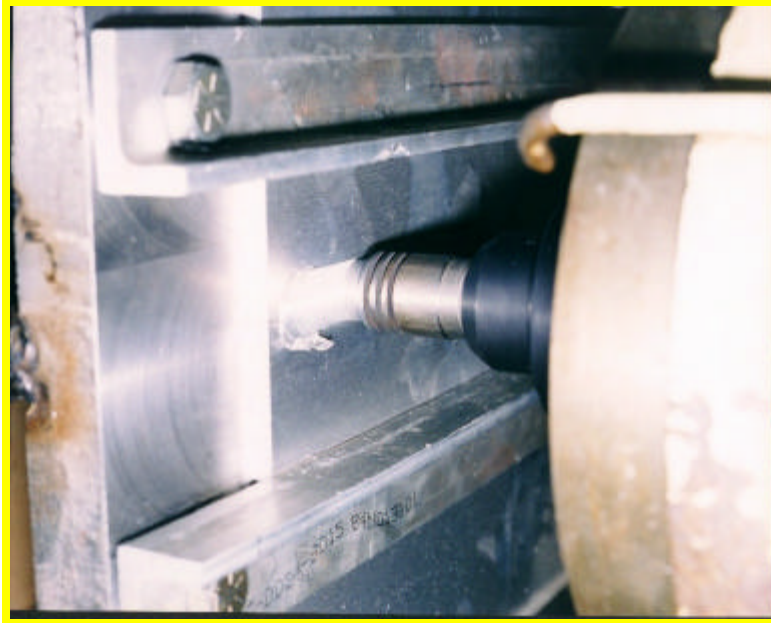


Friction Stir Welding Development for Aerospace Materials



Objective

Friction stir welding is a new technology that was first developed at The Welding Institute (TWI) of Cambridge, United Kingdom. Friction stir welding uses a rotating pin tool to crush, stir, and forge a bond between two metal plates. Because this does not melt the material as fusion welding techniques do, the weld has excellent mechanical properties and exhibits very little shrinkage or distortion, even in long welds. Friction stir welding makes it possible to weld metals previously considered unweldable, notably the 7000 series aluminum alloys. No shielding gas or filler metal is required for this process. Reliability is excellent with friction stir welding, as the only variables are pin penetration, rotation speed, and welding speed. NASA engineers have advanced the friction stir welding technology by making significant improvements required for manufacturing. Most notable is the automated retractable pin-tool, U.S. Patent #5,893,507. This automated tool retracts the welding pin inside of the shoulder, thus, closing out the keyhole upon weld termination.

Why Needed

Friction stir welding process has been proven for a variety of aluminum alloys including both 2219 and 2195, currently used in the Space Shuttle program. It is also the leading candidate process to join advanced materials such as particulate metal matrix composites and nanophase aluminum. Friction Stir Welding process attributes include reliability and repeatability, thus, reducing likelihood of weld defects and flaws. These attributes present an opportunity for significant cost savings to NASA manufacturing programs while increasing hardware quality.

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Sponsor

External Tank Project